

Claims

1. A method of preparing a formulation comprising an ion-conducting polymeric material, the method comprising:

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(a) selecting an ion-conducting polymeric material of a type which includes:

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(i) phenyl moieties;

(ii) carbonyl and/or sulphone moieties; and

(iii) ether and/or thioether moieties;

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(b) selecting a solvent mixture comprising water and a first organic solvent in which mixture said ion-conducting polymeric material can be dissolved and/or dispersed;

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(c) dissolving and/or dispersing said ion-conducting polymeric material in said solvent mixture;

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(d) removing greater than 80% of the total amount of said first organic solvent in said solvent mixture, thereby to leave a formulation comprising said ion-conducting polymeric material dissolved and/or dispersed in a solvent formulation comprising a major amount of water.

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2. A method according to claim 1, wherein said first organic solvent selected in step (b) is water miscible at 25°C and has a boiling point of less than that of water.

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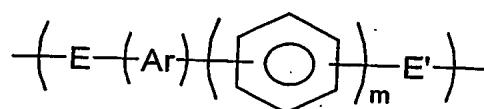
3. A method according to claim 1 or claim 2, wherein said first organic solvent has up to 5 carbon atoms.

4. A method according to any preceding claim, wherein said first organic solvent includes an hydroxyl, ether or carbonyl functional group.
5. A method according to any preceding claim, wherein said first organic solvent is selected from acetone, methylethylketone, ethanol and tetrahydrofuran.
6. A method according to any preceding claim, wherein 10 said solvent mixture includes an optional second organic solvent having a boiling point which is greater than that of said first organic solvent.
7. A method according to claim 6, wherein said second 15 organic solvent has a boiling point at atmospheric pressure which is at least 20°C greater than the boiling point of said first organic solvent.
8. A method according to any preceding claim, wherein the 20 ratio of the wt% of water to the wt% of said first organic solvent is in the range 0.25 to 2.5.
9. A method according to any preceding claim, wherein 25 said solvent mixture of step (c) includes at least 1wt% and less than 20wt% of said ion-conducting polymeric material.
10. A method according to any preceding claim, wherein step (c) of the method is carried out at a temperature 30 which is less than the boiling point of the solvent mixture.

11. A method according to any preceding claim, wherein after removal of the first organic solvent the solvent formulation which includes a major amount of water includes at least 10wt% and less than 30wt% of said ion-conducting polymeric material.

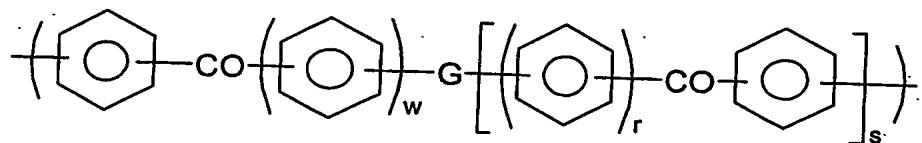
12. A method according to any preceding claim, wherein said ion-conducting polymeric material includes:

10 a moiety of formula

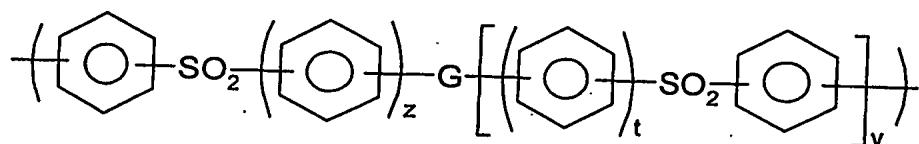


and/or a moiety of formula

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and/or a moiety of formula

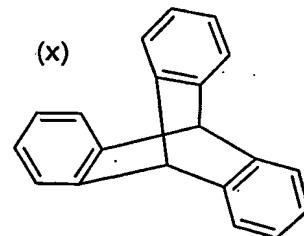
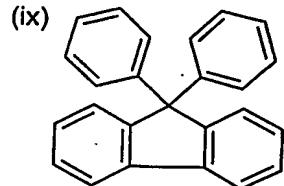
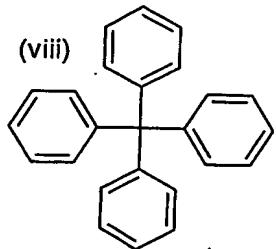
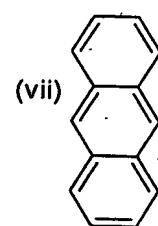
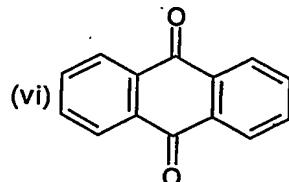
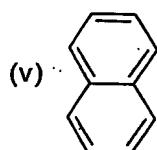
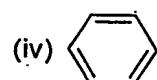
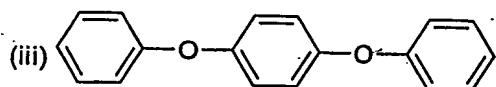
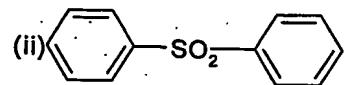
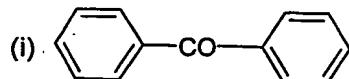
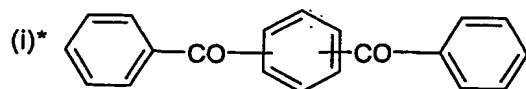


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wherein at least some of the units I, II and/or III are functionalised to provide ion-exchange sites, wherein the phenyl moieties in units I, II, and III are independently optionally substituted and optionally cross-linked; and

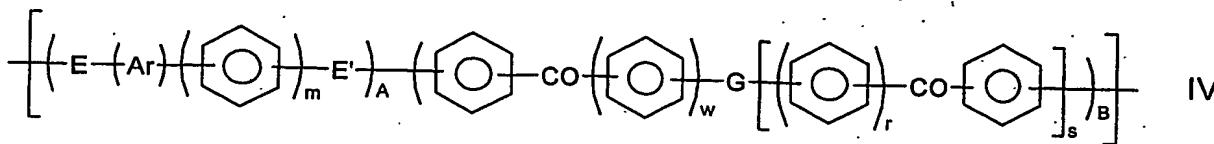
5 wherein m, r, s, t, v, w and z independently represent zero or a positive integer, E and E' independently represent an oxygen or a sulphur atom or a direct link, G represents an oxygen or sulphur atom, a direct link or a $-O-Ph-O-$ moiety where Ph represents a phenyl group and Ar is selected from

10 one of the following moieties (i)* or (i) to (x) which is bonded via one or more of its phenyl moieties to adjacent moieties

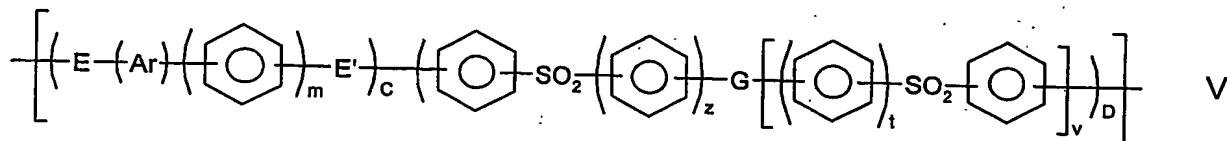


13. A method according to any preceding claim, wherein said polymeric material is sulphonated.

5. 14. A method according to any preceding claim, wherein said polymeric material is a homopolymer having a repeat unit of general formula



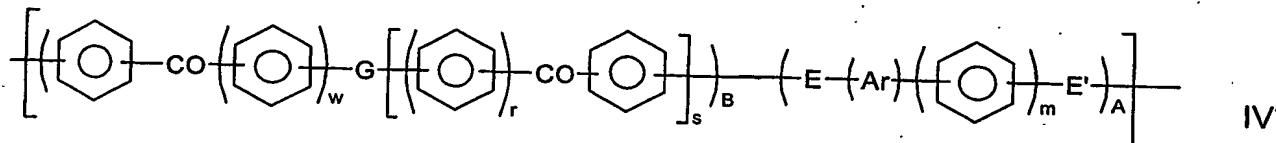
or a homopolymer having a repeat unit of general formula



or a random or block copolymer of at least two different units of IV and/or V provided that repeat units (or parts

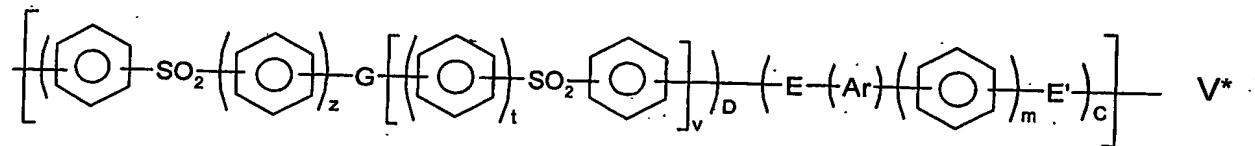
5 of repeat unit) are functionalised to provide ion-exchange sites;

or a homopolymer having a repeat unit of general formula



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or a homopolymer having a repeat unit of general formula



or a random or block copolymer of at least two different units of IV* and/or V* provided that repeat units (or parts

15 of repeat units) are functionalised to provide ion-exchange sites;

wherein A, B, C, and D independently represent 0 or 1 and E, E', G, Ar, m, r, s, t, v, w and z are as described in claim 12.

5 15. A method according to any preceding claim, wherein said ion-conducting polymeric material includes at least some ketone moieties in the polymeric chain.

10 16. A method according to any preceding claim, wherein said ion-conducting polymeric material includes -ether-biphenyl-ether-phenyl-ketone-units.

15 17. A polymeric material containing formulation (hereinafter "said pmc formulation") which comprises an ion-conducting polymeric material dissolved and/or dispersed in a solvent formulation wherein:

(a) said ion-conducting polymeric material includes:

20 (i) phenyl moieties;
(ii) carbonyl and/or sulphone moieties; and
(iii) ether and/or thioether moieties; and

(b) greater than 50 wt% of said solvent formulation is made up of water.

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18. A polymeric material according to claim 17, wherein said PMC formulation includes at least 9wt% of said ion-conducting polymeric material.

30 19. A method of fabricating an article, the method including the step of contacting a member with a formulation as described in any preceding claim.

20. A method according to claim 19, which is used to deposit the polymeric material on said member.